Notice of Determination
State Operation Permit Tracking No. SOP-05029
Sugar Hollow Apartments, Elizabethton, Carter County
11/1/05

Introduction

On April 25, 2005, Tennessee Wastewater Systems, Inc. submitted an application for a wastewater treatment system to serve a low-income apartment complex in Carter County just south of the City of Elizabethton. The Department of Environment and Conservation (TDEC), Division of Water Pollution Control (WPC) published a draft permit for the wastewater treatment facility for this apartment complex on April 29, 2005 in order for the applicant and the public with a basis on which to make technical comments. Also, on this date, the division issued a public notice for a public hearing on the draft permit to be held in Elizabethton on June 9, 2005. The hearing was held on June 9, 2005, and was followed by a comment period, which was extended through July 25, 2005. This notice of determination addresses the citizen comments presented at the hearing and submitted during the comment period that followed. It also presents TDEC's decision regarding the permit and the rationale for that decision.

Project Description

The facility to be served by the wastewater treatment system is a proposed 88 unit apartment complex. Access to the facility is via Lexington Avenue, which also serves the Colonial Acres Subdivision. The area is not served by public sewer and existing homes utilize septic tanks and subsurface disposal fields.

The application and accompanying preliminary engineering report describe the proposed treatment system as STEP/STEG collection system, recirculating packed bed filter, and drip dispersal. STEP refers to septic tank effluent pumped and STEG refers to septic tank effluent gravity. The design flow is 17,600 gallons per day representing 200 gallons per unit per day. The proposed treatment system may be described as a three-stage type process. Stage 1 utilizes septic tanks, that remove large solids and provide primary treatment. Stage 2 utilizes a recirculating biological filter followed by mechanical filtration and disinfection. This provides a high level of secondary treatment by attached bacteria in the presence of oxygen. Stage 3 utilizes a drip irrigation system which uses specially designed pipe to disperse the final effluent into the shallow soils where it is further treated by physical and biological mechanisms including aerobic decomposition, anoxic denitrification, evaporation, transpiration and others. For the Sugar Hollow project, the three treatment stages are not at the same physical location, so pump stations will transfer the wastewater between stages.

Area Description

The area to the south of Elizabethton in Carter County where the proposed apartment complex and existing homes are located is underlain by a type of geology known as "karst." In this type of geology, the underlying limestone is subject to dissolving into the natural ground water leaving cavities that can collapse forming sinkholes (enclosed depressions). Sinkholes are a typical prominent surface feature of this type of geology. Surface drainage into these sinkholes enters solution channels in the underlying limestone and serves to recharge springs and streams in the area. One such spring is Big Spring, a major water supply source for the City of Elizabethton.

In accordance with TDEC Rule 1200-5-1-.34, the City of Elizabethton has prepared a Wellhead Protection Plan for Big Spring. The plan designates an area of approximately 4700 acres to the east of the spring as being the potential recharge area. The proposed apartment complex and its wastewater treatment system are to be located within this area. The proposed facility is shown as an overlay on a topographic map of the area in the attached Figure 1.

Chronology of Project

The original application, submitted on January 27, 2004, proposed the wastewater treatment facility to be located just north of the apartment site with the drip area in a hayfield on the inner slope of an open throated sinkhole. The sinkhole was located approximately 4,500 feet east of Big Spring. The department issued a notice to deny this permit on March 8, 2004 and made a formal denial on July 6, 2004. The applicant, Tennessee Wastewater, Inc., appealed the denial on August 6, 2004.

Tennessee Wastewater, Inc. submitted a new application on June 16, 2004 for a wastewater disposal area known as the "Cell Tower Site" located north of Bryant Ridge. This location is a wooded hillside on the boundary of the wellhead protection area. The area is approximately 2 miles from Big Spring.

In September 2004, a dye study, authorized by the City of Elizabethton, was conducted by injecting dye in a sinkhole at the proposed apartment site. The study confirmed that water from that sinkhole flowed to Big Spring. In December 2004, a dye study was conducted at the Cell Tower Site by consultants Enviro Technologies Remediation, Foundation Systems Engineering, and Tysinger, Hampton & Partners acting on behalf of the applicant, Tennessee Wastewater, Inc. The dye was injected on December 23 and samples taken over the next four weeks from Big Spring, Gap Creek, and springs along the Doe River. No dye was detected. A repeat test using four times the original amount of dye was initiated on February 11, 2005, at the same location. Sampling was conducted at wells to the east of the site, Big Springs, Grand Dad Spring and 5 springs along the Doe and Watauga Rivers. No dye was ever detected.

The final report on the dye studies was submitted on March 14, 2005, and included a March 9, 2005, memo from Dr. Albert Ogden, Department of Geosciences, Middle Tennessee State University. Dr. Ogden stated that in his professional opinion the drip field was not hydrologically connected to Big Spring. The department subsequently found that the Cell Tower Site had inadequate area of soil that met technical conditions that would allow all of the wastewater to be disppersed at this site and notified the applicant that additional area would be needed.

The department met with the apartment developer and representatives of Tennessee Wastewater, Inc. on March 15, 2005. The developer requested that the department withhold the decision on permit issuance until additional suitable land for drip dispersal could be located. On March 29, 2005, the department received a revised application to include two additional sites for drip disposal located west of the Cell Tower site. The two new sites have been labeled as the "Gun Range" site and the "Cornfield" site. On April 25, 2005, the department received a soil survey and topographic data for the new sites, which indicated that the three sites combined may be adequate for drip dispersal. Based on this data, it was determined that a draft permit could be prepared. Subsequently on April 29, 2005, the draft permit was presented and the public hearing announced.

Public Hearing Comments

The June 9 public hearing was held at the Sycamore Shoals State Park in Elizabethton. The hearing was attended by 105 people, 25 of whom made oral comments. There were 4 submittals in the form of

statements or resolutions. During the comment period that followed, the department received approximately 27 letters and 13 e-mails/phone calls. Most respondents were opposed to issuance of the permit. The primary concern was the safety of the public water supply at Big Spring. The many comments were grouped into a list of 21 similar comments/questions. The comments/questions are addressed in the following response followed by the final determination on the permit:

1. **Doesn't state and federal law prohibit the discharge of fluids not meeting national primary drinking water standards into groundwater used as a source of public water supply?**

   The national drinking water standards (which have been adopted by Tennessee) apply to water at the customer's tap. It is the responsibility of the public water utility to assure adequate treatment to meet these standards. TDEC also protects groundwater and surface waters designated for water supply use based on published criteria. The groundwater in the vicinity of Big Spring is classified for General Use (see Rule 1200-4-3-.07 (2) (b)). For this use Table 1 of the criteria specifies 14 metals and 7 other constituents and their corresponding concentrations, which may not be exceeded. These criteria are consistent with the federal and state primary drinking water standards. So long as these concentrations are not exceeded in the groundwater, state or federal rules do not prohibit the discharge of properly treated wastewater.

2. **Why is wastewater disposal being allowed in karst areas (areas where there are sinkholes)? The WPC 305(b) report and design criteria for Slow Rate Land Treatment (Chapter 16) suggest that these areas are to be avoided.**

   The areas to the south of Elizabethton in Carter County where the apartment complex, the biological filter, and the drip system are proposed to be constructed are in karst geology (the underlying limestone is subject to dissolving into the natural ground water leaving cavities that can collapse). Sinkholes are a typical prominent surface feature of this type of geology. This type of geology is not unique to the Elizabethton area or to Carter County.

   Karst geology underlies most of middle and east Tennessee. Seventy-seven of the 95 counties in the state (81%) have documented sinkholes. Analysis of USGS quadrangle sheets (a quad sheet covers approximately 59 square miles) within the state show that there are 29 counties with more than 10 percent of the surface area draining to sinkholes. This is a large area of the state where people must live and work, and where wastewater must be dealt with.

   Where land application of wastewater is involved, it is preferred that treated wastewater discharges be placed into areas of uniform soil conditions where the movement of the treated wastewater underground is slow and predictable and is likely to receive additional physical and biological treatment as well as dilution. Discharges to sinkholes can flow quickly into the underlying limestone where the water travels through solution channels to outlets down gradient, usually seeps, springs, or streambeds. Where solution channels are involved, the time of travel from the sinkhole to the outlet can be relatively quick allowing for little additional treatment or dilution (during non storm flow periods).

   In karst geology, regardless of whether a discharge is to a sinkhole or to another area where there is no visible surface feature indicating a sinkhole, some of the water will reach the underlying limestone where it can intercept solution channels leading to seeps,

springs or streambeds. Thus it is impracticable to disallow all wastewater discharges in these areas, but rather it is necessary to see that the wastewater is treated to a level that will protect the ground water and that setbacks from sinkholes are established and maintained. This is accomplished through a permitting process which specifies that adequate site soil and topography conditions are met, requires submission, review and approval of adequate primary, secondary and land application treatment design, and spells out appropriate numeric and narrative effluent limitations in an enforceable permit for the wastewater being treated.

Wastewater collection, treatment and land disposal is already occurring in the sinkhole areas south of Elizabethton. Homes within the Colonial Acres subdivision and other private developments are currently discharging to septic tanks and subsurface disposal fields. The City of Elizabethton is employing individual grinder pump type wastewater collection systems for homes along Southside Road.

3. How can the groundwater be protected if a sinkhole subsidence causes failure of the septic tanks, the pump stations or the pressure sewer lines?

Subsidence is always a possibility in karst geology, but its occurrence is not frequent. It can affect homes, schools, churches and their wastewater treatment systems, plus roads, buildings, and any structures located within the collapse area. The only way to completely eliminate this risk is to prevent all development in areas of karst geology, which is impracticable. Additionally, this risk already exists in the area due to the presence of several hundred homes with septic tanks and subsurface disposal systems. Also the City of Elizabethton operates a number of pump stations as well as pressure and gravity sewer lines in the area.

One way to minimize this risk is to undertake borings beneath major structures to determine if cavities exist.

4. How can wastewater disposal be allowed in a wellhead protection area?

TDEC rules, 1200-5-1-.34(1)(e) requires that a community public water supply (PWS) using a groundwater source must designate two zones of protection for their groundwater source. The first is a well protection zone (Zone 1) and the second is a wellhead management zone (Zone 2). The City of Elizabethton Community Water Supply has approximately 11,700 connections. For this size system the Zone 1 is specified a radius of 750 feet around Big Spring. Neither the proposed apartment complex nor any of the proposed treated wastewater disposal fields fall within this zone. Zone 2 is defined as the total area from which water most likely will drain to Big Spring. Zone 2 has been defined as an area encompassing approximately 4700 acres south of the city.

The PWS must also prepare a wellhead protection plan, which addresses hazardous chemical use, storage, spill response notification and contingency planning. The plan is also required to include public education and participation, proposed local ordinances, proposed zoning changes and other institutional controls. The City of Elizabethton notified the Carter County Planning Commission of its intent to pursue a wellhead protection plan in April 1994. The city published the plan for Big Spring in August 1998 and submitted it to TDEC. The plan was reviewed and approved by TDEC in January 1999. The plan lists the number one potential contaminant source as septic systems. It

states that there are 1,000 septic systems within Zone 2 and 32 septic systems within Zone 1. Also listed as potential contaminant sources are lawn and garden chemicals, livestock, cemeteries, horse farms, sinkholes, Gap Creek, and abandoned wells. There is no mention of the grinder pumps, pressure sewers, and gravity sewers operated by the city in the wellhead protection zone lying north of Bryant Ridge. The plan proposed no local ordinance, zoning change, or other institutional control that would preclude future disposal of treated domestic wastewater.

More than 300 wellhead protection areas have been designated across Tennessee ranging in size from just a few acres to several thousand acres. These areas comprise approximately 2.5 percent of the land area of the state. TDEC has permitted 13 drip/spray type wastewater treatment systems, which are currently operating in wellhead protection areas. These systems have design capacities between 1,000 gallons per day and 600,000 gallons per day. The wastewater sources include municipalities, subdivisions, mobile home parks, resorts, schools, churches, and private businesses. These systems are successfully operating without contamination of the public water supply.

Since the publication of the draft permit and the public hearing, Carter County has adopted a wellhead protection resolution. The resolution does not permit onsite disposal systems or holding tanks receiving in excess of 1,000 gallons of effluent per day. It also requires a minimum lot size of five acres. It allows up to 2,500 gallons per day for an onsite system discharging to a stream as approved by TDEC. The resolution does not restrict small septic tanks and conventional drainfields discharging to sinkholes. It does not restrict the use of pump stations or pressure sewer lines. It does not address subsidence risk.

Design criteria from the Divison of Water Pollution Control stipulates that 350 gallons per day of wastewater is generated from private homes (100 gallons per person per day times an average of 3.5 persons per home). Based on this criteria and the number of homes indicated in the wellhead protection plan, there is presently 350,000 gallons of septic tank effluent being land applied each day in the area. The Sugar Hollow project represents approximately a 5 percent increase in this flow.

Based on the record of the land application treatment systems currently operating in the state, there is no evidence to indicate that a properly designed and operated wastewater treatment system (including home septic tanks and disposal fields) located within a wellhead protection area will cause a health hazard or condition of pollution in the public water supply.

5. A dye study conducted near the apartment site showed that water reaching a nearby sinkhole will flow to Big Springs. The potential is high that this can also occur for water leaving the drip area sites. How can this be allowed?

A dye study authorized by the City of Elizabethton and conducted by Robert Benfield in September and October 2004 showed that flow from a sinkhole near the proposed apartment reaches Big Spring. This finding was not unexpected since the proposed apartment site lies within the recharge area of the spring as delineated in the City's wellhead protection plan. The sinkhole tested is located approximately 4,500 feet from

Big Spring. The location of the proposed wastewater treatment system is approximately 10,000 feet from Big Spring and located to the north of Bryant Ridge.

Although the area immediately to the north of Bryant Ridge is located in the designated wellhead protection area, there are differing opinions as to whether flows to the groundwater in that area connect to Big Spring. TDEC required the applicant to conduct a dye study of a sinkhole north of Bryant Ridge near the cell tower site. The results of this study were inconclusive. The applicant and his geotechnical consultants proposed that flows into sinkholes located to the north of Bryant Ridge most likely travel to Gap Creek at locations downstream of Big Spring. Until there is conclusive evidence presented to demonstrate otherwise, TDEC has taken the position that all flows entering the groundwater within the wellhead protection area can reach Big Spring. The department's position is that any treated wastewater discharges in the area must meet criteria that will be protective of Big Spring.

Big Spring has an average flow of approximately 1,600 gallons per minute (2.3 million gallons per day). The treated wastewater from the apartment is expected to meet state groundwater quality criteria (similar to drinking water criteria) when it leaves the drip disposal sites. Even if one assumes that all the treated wastewater from the drip sites reaches the spring, the dilution would be 132 to 1. At this dilution, no pollutants would be detectable at the spring. To put this into perspective, the City of Elizabethton discharges approximately 3.5 million gallons per day of wastewater into the Watauga River, which has a minimum flow of 104 million gallons per day. The treatment provided combined with the dilution of 30 to 1 is sufficient to protect the Johnson City water supply located 6.8 miles downstream.

6. Following the dye study at the apartment site, the state required a dye study of the Cell Tower site. Why was no dye study required of the Gun Range and Cornfield sites?

Two dye trace studies of a sinkhole near the cell tower drip disposal site were conducted by the applicant in December 2004 and February 2005. The injected dye was not detected in water samples taken from Big Spring or any of the other springs and streams sampled. Because no location was found where the dye reached the surface, the tests were determined to be inconclusive. Although additional dye testing could have been required for the Gun Range and Cornfield sites, there was a high probability that the results would also be inconclusive. Thus, TDEC determined to take the position that treated wastewater reaching the ground water beneath all three proposed drip disposal sites could reach Big Spring. As stated above, it is the position of the Department that treated wastewater discharges must meet criteria that will be protective of Big Spring.

7. The effluent limits in the proposed draft permit will allow pollution of groundwater, not only at Big Springs, but also in wells on nearby property.

It has been asserted that the proposed treatment system will contaminate the groundwater immediately adjacent to the site or nearby wells. The pollutants of concern are nitrates and bacteria. Tennessee ground water quality criteria are established in Rule 1200-4-3-.08, Ground Water Criteria. The rule provides for 5 separate classifications of groundwater, (1) Special Source, (2) General Use, (3) Limited Use, (4) Site Specific Impaired, and (5) Unusable. The ground water in the Big Spring wellhead protection

area is classified as General Use. Under this use classification there are specific numeric criteria for nitrates and bacteria. The nitrate criteria reflects a maximum allowable concentration of 10 mg/l and the bacteria criteria (expressed as the E. coli concentration) reflects a maximum allowable concentration of 630 colonies per 100 ml as a geometric mean of a minimum of 5 samples. With regard to bacteria, the proposed permit requires that the effluent be disinfected to 23 E. coli colonies per 100 ml before the wastewater is dripped onto the irrigation sites. Thus there is no potential for water to exceed the bacterial criteria.

Nitrates in the wastewater discharged to the drip disposal area is expected to have a concentration of approximately 25 mg/l. The nitrates will be treated in the soil by plant uptake and bacterial denitrification and will be subject to dilution by direct rainfall. By applying a mass balance calculation (the equation for this calculation is specified in Chapter 16 of the division's design criteria) it can be shown that the treated wastewater leaving the drip disposal site will be 10 mg/l or less. Thus it will not be possible for the treated wastewater to cause an excedance of the drinking water criteria in nearby wells or in Big Spring.

The proposed draft permit contained numeric effluent limitations for the secondary portion of the treatment system, the packed bed biological filter. These limits apply before the drip irrigation, i.e., before the additional treatment that is provided in the soil. The limits were 30 mg/l BOD (biochemical oxygen demand), 5 mg/l ammonia, and 23 colonies/100 ml for E. coli. BOD is a parameter commonly used to measure the organic content of wastewater and how well a biological treatment plant is operating. A concentration of 30 mg/l BOD as a maximum daily limit is 33% lower than that which is normally applied to other similar treatment systems throughout the state and is a value that indicates better than normal secondary treatment prior to drip irrigation (for instance a septic tank would be expected to discharge much higher BOD concentrations in the range of 100 to 150 mg/l). Monitoring data received by the Department indicates that most of these biological filters produce an effluent containing less than 10 mg/l BOD. Following drip irrigation, the BOD concentrations reaching the ground water are anticipated to be less than 5 mg/l.

Ammonia is also a parameter typically used as a measure of the effectiveness of secondary treatment. An effluent concentration of 5 mg/l or less indicates a well-operated plant and is a typical concentration established in permits for this type treatment facility. Following drip irrigation ammonia concentrations in the treated water are expected to be below 1.0 mg/l.

E. coli is a bacterial test used to as an indicator of the presence of human pathogens. Required testing for E. coli is not typical in permits for these type treatment systems, but disinfection of the wastewater was required in this case because of the potential for the treated wastewater to reach a public water supply. Normally for these type systems, an E. coli limit of 941 colonies per 100 ml is established. However, in this case a significantly more stringent effluent limit has been proposed at 23 colonies per 100 ml (by comparison a typical home septic tank system can discharge fecal bacteria concentrations in the range of 100,000 to 100 million colonies per 100 ml). Disinfection of the biological filter effluent followed by bacterial removal/die off in the soils of the drip area will reduce bacterial concentrations to deminimus levels.

8. The proposed permit requires that there be no discharge to surface or ground water, yet WPC admits that at times water from the drip areas will enter the groundwater. The "no discharge" requirement is also in conflict with the requirement that the system obtain a Class V disposal well permit under Underground Injection Control rules. Why should a "no-discharge" system have to obtain an injection well permit?

The State Operation Permit is a no discharge permit in the sense that it allows no direct point source discharge of wastewater to surface waters. Rather the discharge is dispersed underground. A point source discharge is defined by State and Federal rules as "*any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged*." Point source discharges are required to have National Pollutant Discharge Elimination System Permits (NPDES), which are administered by TDEC. Because a drip irrigation system disperses the treated wastewater into the soil and does not discharge to surface waters, it is not considered a point source discharge. However, because these systems have the potential to affect waters of the state, either surface or sub-surface, the division permits them under the authority provided by the Tennessee Water Quality Control Act via the State Operation Permit program.

The treated wastewater, which is discharged just a few inches below the surface in a drip dispersal area, is taken up in the cover crop root zone. During most of the year, this treated effluent is removed by evapotranspiration (water taken up by plants and evaporated through the leaves) and does not reach the groundwater. However, during periods of high rainfall or winter months, some of the treated wastewater reaches the ground water table. In comparison, conventional septic tank drainfield effluent is placed deeper in the ground below the root zone where a higher percentage of it may reach the ground water.

TDEC has published rules (similar to those of EPA) for the Underground Injection Control program, which is administered by the Division of Water Supply for the purpose of protecting groundwater resources. These rules address injection wells, which are defined as a structure or other device which is used for the placement of fluids into a subsurface stratum. The rule provides for five injection well classifications, those posing the most risk as Class I and those posing the least risk as Class V. The Class V group contains a broad range of well types including large capacity subsurface fluid distribution systems with the capacity to serve more than 20 people. The Sugar Hollow wastewater treatment system falls into this classification.

Class V injection well permits require an application be submitted containing information similar to that required for the SOP permit. Because of the low risk involved, these permits are normally issued as a formality and contain no special requirements that would preclude the operation of the proposed wastewater treatment system.

9. The treatment system, consisting of large septic tanks, pump systems, etc. poses a significant risk to the water supply, due to the high potential for release of untreated

wastewater into the nearby sinkholes. The state should prepare a risk assessment for this project.

The proposed wastewater treatment system includes multiple septic tanks at the apartment site, a pump station at the apartment site, a pressure line between the apartment site and the Cornfield site, a treatment unit at the Cornfield site with pumps to recirculate the wastewater, and distribution lines to the three drip disposal areas. There is always the potential for these pumps to fail allowing wastewater to overflow. This is the case for any public or private wastewater system within the state. To minimize this risk, TDEC requires that wastewater pump stations have duplicate pumps such that each pump can carry the design flow. In addition the pump stations are equipped with telemetry equipment designed to phone the operator when there is a problem such as a power outage.

Pumping of raw sewage within the Big Spring wellhead protection area is already taking place in the vicinity of Southside Road where the City of Elizabethton maintains a number of grinder pumps serving individual homes in the area. There have been no reported problems occurring from these pumping operations.

For municipal wastewater pump stations, the division typically places a requirement in the permit that these systems be visited daily. In view of the citizen concern and the potential that raw sewage could reach Big Spring in the event of a pump station failure, such a requirement will be considered for this permit.

10. How can the drip irrigation system function in the winter when the ground is frozen?

The drip irrigation lines are installed approximately 6 to 10 inches beneath the ground surface. During winter periods the wastewater is warmer than the surrounding soil and does not freeze during each dosing cycle. The drip lines are installed with many openings to the atmosphere such that they drain between dosing cycles and do not freeze. The 188 drip systems operating in Tennessee have experienced no winter freezing problems. Drip irrigation systems are used in states as far north as Minnesota and Wisconsin where winter temperatures are much colder than found in Tennessee.

11. Can the State guarantee that there will be no release of pollutants that will contaminate the water supply? If there is a release of pollutants that shuts down the water supply, who will pay for the damages?

It is the responsibility of TDEC to see that facilities generating sewage provide adequate treatment of the wastewater to protect the groundwater and surface water. This is done through the issuance of permits which contain specific operation requirements that must be met and by the review and approval of engineering drawings and specifications for the treatment facility. Failure to meet the conditions of the permit subjects the applicant to enforcement action and potential penalties. The day-to-day operation of the treatment facility is the responsibility of the permit holder (just like a home owner is responsible for the operation of his/her septic tank and drainfield). The department is not the operator of the treatment system and makes no guarantees regarding it's performance. However, both the department and the public water supply provider can take legal action in the event contamination of the water supply occurs. This can include the recovery of damages.

12. The pretreatment system being proposed (recirulating biological filter) generates a highly nitrified wastewater. WPC design criteria indicate that highly nitrified effluents should be avoided for land application purposes. Shouldn't aerated or facultative wastewater stabilization ponds be used for pre-treatment since they produce a less nitrified effluent?

With regard to nitrates, the division requires that the applicant demonstrate that any treated wastewater that percolates to the ground water meet ground water use criteria. The demonstration (which is reviewed by division personnel) is based on design criteria published in Chapter 16, of Design Criteria for Sewage Works. This involves performing a month-by-month nitrogen balance on the drip areas using the equation or equivalent methodology as provided in the design criteria. The analysis must demonstrate that during the most critical month (usually late winter months) the percolate nitrate concentration will equal or be less than 10 mg/l. The applicant for the Sugar Hollow project made such a demonstration and the division concurs with the calculations. Thus there is no reasonable potential for nitrate concentrations to be exceeded in ground water leaving the drip sites.

It has been asserted that because Chapter 16 of the design criteria indicates that maximum nitrogen removal occurs when nitrogen is applied in the ammonia form that a treatment system that highly nitrifies (such as the recirculating biological filter) is inappropriate for land application. The inference is that a treatment system that produces a higher percentage of ammonia to nitrate is better. However, the literature shows that ammonia is quickly converted to nitrates by nitrifying bacteria in the soil. Thus it is the combined total amount of nitrogen (the nitrate and ammonia) that must be considered in the design. Actually, the recirculating biological filter reduces the combined total amount of nitrogen that enters this treatment system. In other words, this treatment system discharges less nitrogen (per equivalent flow quantity) than individual home septic tanks.

It has also been suggested that a facultative lagoon should be employed as the Stage 2 treatment because this type treatment system provides less nitrification. Facultative lagoons, if designed with depths and holding times for such purposes, can produce an effluent with less total nitrogen than the recirculating sand filter. However, lagoons require a large land area footprint and engineered liners to prevent leakage of the wastewater. Such systems are usually not feasible in topography such as that found in the area.

13. Who is responsible if the apartment project causes rainfall runoff quantity to increase (i.e., flooding) such that my property is affected?

Whenever there is development in a community, there is the potential for the storm water runoff volume and peak flowrate to increase. This is usually the result of the replacement of some of the pervious natural vegetated land (grassland and forest) with impervious materials (roofs, roads, paved parking areas). The authority of TDEC to regulate water discharges is based on laws and regulations dealing with water quality. The department does not have the authority to regulate flow quantity, unless the increased quantity can be directly related to a water quality problem. Storm water quantity issues are best addressed through local ordinances.

14. How will sediment be prevented from entering the sinkholes and flowing to the water supply during construction of the project?

Sediment is perceived to be an issue only during construction of the apartment project and the wastewater treatment facility. Because this project will involve land disturbance of greater than one acre, the developer will be required to obtain coverage under the TDEC Construction General Storm Water Permit (CGSWP). This permit is separate from the wastewater discharge permit and was not the subject of the public hearing or the comment period.

The department issued a Notice of Coverage on April 19, 2005. The general permit requires that developer and/or his construction contractor prepare a storm water pollution prevention plan, which specifies how the contractor will provide erosion prevention and sediment control during construction at the site.

15. The project will allow bacteria (particularly E. coli) to enter the public water supply.

The wastewater leaving the septic tanks at the apartment site will be treated in a biological filter, which provides significant reduction of bacteria. Following this filter, the wastewater must be further treated by disinfection (using ultra-violet light) to meet an effluent limitation of 23 E. coli colonies per 100 ml. Following disinfection, the wastewater is further treated in the soil where additional E. coli bacteria are removed. Thus the water leaving the drip irrigation areas is expected to have no significant concentration of E. coli bacteria of human origin.

The disinfected discharge from this three-stage treatment system must be considered in perspective to other existing discharges in the area. Private home discharges into the wellhead protection area are given no secondary treatment, no disinfection, and are not required to monitor for coliform organisms and report to any regulatory agency. These private home systems are discharging coliform organisms in the range of 100,000 to 100 million colonies per 100 ml as opposed to the 23 coliform organisms established as the maximum daily limit in the draft permit for the Sugar Hollow project. The City of Elizabethton currently discharges treated wastewater to the Watauga River with a maximum daily limit of 1,000 fecal coliform organisms per 100 ml. This discharge is approximately 6.8 miles above the water supply intake of the City of Johnson City, but does not pose any significant risk to the water supply.

16. Why hasn't this project been made to tie onto the public sewer system of Elizabethton?

The department requires that applicants for State Operation Permits consider other alternatives including connection to an existing public sewer system. For this project the applicant approached the City of Elizabethton regarding the use of the sewer system. Two routes were considered possible, (1) connection to the system via a northern route leading to a pump station on Lynn Avenue or (2) via an eastern route to the sewer interceptor paralleling State Line Road. Information obtained from the city indicated that the sewer line and pump station along Lynn Avenue is operating near capacity and could not take additional flows without major improvements. The cost of these improvements was determined to be significantly greater that that of providing a wastewater treatment facility for the project. Discharge to the sewer interceptor along State Line Road was

denied by the city because the remaining capacity of the sewer is being reserved for industrial use.

17. What data has been presented to demonstrate that the soils are adequate to provide treatment at the drip sites?

For land application systems to function properly, adequate soils are necessary to provide the tertiary treatment function. There must be enough depth of soil above any impermeable layer in order to assure that the wastewater can percolate downward and disperse laterally. The soil must also have proper permeability, i.e., one that is high enough to allow the wastewater to percolate downward as fast or faster than it is being applied, but not so fast as to prevent sufficient time for biological treatment and plant uptake to occur. Also the slopes of the disposal site must be within a range that will not cause wastewater breakout down slope or conditions of potential slope instability (generally less than 30% slope). The site must also have adequate setbacks from open throats of sinkholes, streams, springs, residences and property boundaries.

TDEC requires the applicant to provide a topographic map of each drip site and an extra high intensity soil survey. The soil survey must be prepared by a soil scientist approved by the Division of Ground Water Protection. For the three drip-disposal sites proposed by Tennessee Wastewater, Inc., topographic maps were prepared and soil surveys were conducted. For the Cell Tower site, the major soil types were Waynesboro, Braxton and Etowah. Borings were made of the site at 191 locations. 151 borings showed soil depths greater than 4 ft., 12 borings showed soil depths of between 3 and 4 ft., and 28 borings had depths less than 3 ft. Slopes were in the range of 25% to 30%. Considering setbacks and avoidance of shallow soil areas, approximately 1.5 acres of the site was found useable for drip irrigation. These soils and slopes were considered suitable for drip irrigation at the rate specified by the applicant, 0.85 to 1.13 inches per week.

Topographic mapping and soil mapping of the Gun Range site was conducted and presented to the department. This site contains primarily Minvale and Dunmore soils. Limited sampling of the site was conducted and the soil depths were estimated based on typical conditions in which these soils are found. Slopes of this area were found to range from 10 to 14 %. Approximately 1.3 acres are proposed by the applicant to be available for spray application. On June 28, 2005, the Division of Water Pollution Control requested that the applicant submit soil boring information for the Gun Range site. As of the date of this notice of determination, this data has not been provided.

A topographic map and soil survey of the Cornfield site was submitted to the department. This site contains primarily Dunmore, Etowah, and Emory soils. Soil depths were estimated. Slopes ranged from 6% to 14%. The applicant proposed that approximately 1.3 acres is available for drip irrigation. Soil borings were requested for the site and have not been received as of the date of this determination.

18. How can the permit applicant, Tennessee Wastewater, Inc. operate the system if they are located in Nashville (their listed address)? Will they be required to have a trained operator?

Although the listed address of Tennessee Wastewater, Inc. is in Nashville, the company maintains an office in East Tennessee in Concord, Knox County. The distance from this

office to the site is approximately 175 miles (about 3 hours travel time). It is reasonable for the operator to visit the site conduct the routine maintenance and the monthly monitoring traveling from this distance. Major components of the system are equipped with telemetry systems that will call the operator in the event of failure. However, in the event of a system failure, i.e., a power outage or other condition that could cause an overflow, a three hour response time is considered too long to allow treated wastewater to overflow into the wellhead protection area. Thus the department believes that a minimum response time of 45 minutes should required for facilities located in wellhead protection areas. This is an issue that can be addressed as part of the permit requirements..

Mr. Michael Hines is the listed operator for the system. He is a certified Grade 1 Collection Operator and a Grade 1 Wastewater Operator. Based on these certifications, he is qualified to operate the treatment system.

19. Have any other drip systems been permitted by WPC in wellhead protection areas? In sinkholes?

TDEC has issued State Operation Permits for approximately 259 land application systems (includes both drip and spray irrigation). Thirteen of these facilities are located in wellhead protection areas. The design flow for these treatment systems ranges from 2,000 gallons per day to 600,000 gallons per day.

Approximately 2/3 of the land application systems permitted in Tennessee are located in areas of karst topography where ground water flows through fractured limestone to feed springs, seeps and streams.

20. Isn't the risk of the treatment system for this apartment greater than that of the many individual home septic tanks in the wellhead protection area? What about risks compared to agricultural practices?

Numerous publications can be cited to show that the wastewater discharge from individual home septic tanks contain significantly higher concentrations of pollutants that the discharge from a three-stage treatment system of the type proposed to serve the Sugar Hollow Apartments. Also it is known that the total quantity of flow from septic tanks in the Big Springs wellhead protection area is approximately 20 times greater than that expected from the apartments. It has further been pointed out that individual home septic tank systems are not subject to routine monitoring or effluent limitations as are required for SOP facility operators. Finally, it has been shown that there are 259 land application type wastewater treatment systems permitted and operating in the state with few problems. Based on these factors, it cannot be concluded that the proposed treatment system for the Sugar Hollow Apartments represents any greater risk to the environment than that of private home septic tanks.

The majority of agricultural practices as well as home lawn and garden activities are not required to have permits from TDEC (one exception is confined animal feeding operations [CAFOs]). These activities were listed in the wellhead protection plan as potential contaminant sources with herbicides, pesticides, and fertilizers being specifically mentioned. Fertilizers are of concern because nitrates are limited to 10 mg/l in drinking water. It is proper to put into perspective the potential sources and quantity of

total nitrogen being land applied in the wellhead protection area. The proposed treatment system for Sugar Hollow is expected to discharge approximately 4 pounds per day of total nitrogen to the drip field in the plant root zone where most of the nitrogen will be utilized. Septic tanks from 1,000 homes will discharge approximately 116 lbs of nitrogen per day to their drainfields, which are typically well below the plant root zone allowing for minimal utilization of the nitrogen. Agricultural operations can apply hundreds of lbs of nitrogen per acre in a single application where it may or may not be totally utilized by the crop. Thus considering these three sources of nitrogen, it can be concluded that the proposed treatment plant poses the least risk.

21. Why is TDEC overruling its local office regarding this project?

TDEC maintains 8 field offices throughout the state. These field offices are assigned specific counties of coverage, which range in number from a minimum of three to a maximum of 18. Applications for State Operation Permits are submitted to the field office in which the project occurs. The applications are reviewed for completeness and forwarded to the Nashville central office for processing of the permit. Permit decisions for these type of systems are always made at TDEC's central office in Nashville. Input from field office personnel, central office personnel, and others with relevant information is always considered in the decision to issue or deny a permit. The permitting of this facility, as with all others, is a collaborative process with the exchange of information between technical staff occurring throughout.

The permit manager, located in Nashville, reviews the input of field office staff, central office staff, and the public to reach a carefully considered and fully informed decision. Final decisions must be made based on legal and technical rationale that is consistent statewide. It is the desire of the department to achieve consensus decisions, but where that isn't possible, we will make environmentally sound and regulatory defensible decisions while continuing to empower those among us who disagree.

Determination

The issuance of a State Operating Permit for treated wastewater disposal requires the consideration of many factors as have been discussed above. Certain factors are critical to the decision making process, particularly where there is the potential for impacts to a major municipal water supply. One important factor determining the adequacy of any wastewater treatment system using drip dispersal as the final treatment step is the soil condition at the disposal site(s). This is particularly important where the drip dispersal is into a wellhead protection area. Thus the division required that extra high intensity soil surveys at 50 foot grid stake be conducted at each proposed drip dispersal site and that soil borings be provided to 4 foot depth or refusal. The soil borings are necessary to accurately determine and map the areas of different soil types and to verify the depth of those soils over the entire drip area.

For the Cell Tower site, an extra high intensity soil survey was conducted, a grid was established and 191 soil borings were provided allowing accurate mapping of the soils and determination of soil depth. The data provided by this work was evaluated to define the area suitable for drip dispersal. Based on information gathered from the borings it was determined that the Cell Tower site was limited to 1.5 acres of area suitable for drip dispersal. Other areas of the site were ruled unsuitable for drip dispersal because of shallow soils as indicated by the borings.

For the Cornfield and Gun Range sites, no grid was established at the site and no data was submitted to the division indicating the number and location of soil borings, if such borings were made. The division notified the applicant of the need for the boring information by letter from Phil Simmons to Michael Hines of June 28, 2005. The applicant responded to the letter via a July 22, 2005 letter (with attached July 7 letter from East Tennessee Soil Consultants). These letters stated that the information submitted to date was adequate based on the interpretation of the soil scientist that conducted the field survey and that the borings were not necessary. The site was reviewed by a TDEC soil scientist on July 12, 2005 and his report indicated differences in the depth and absorption rates for certain soil units as compared to the report submitted by the applicant's soil scientist.

On October 6, 2005 a letter was sent from the division to Mr. Hines stating that the division disagreed with his position that soil borings were unnecessary and requesting that the soil borings data be obtained and sent by October 28, 2005. A response was received from Mr. Hines on October 26, 2005 indicating that adequate information had already been sent to the division. It remains the position of the division that adequate borings data have not been received as of the date of this notice of determination. Based on lack of receipt of this information, the division cannot verify that the Cornfield Site and the Gun Range Site have adequate area of suitable soil for drip dispersal at the application rate proposed by the applicant.

Another important factor for consideration is the ownership of the treatment system and the property upon which the treatment system will be placed. The division requires evidence that this property will be owned by the permittee, Tennessee Wastewater, Inc. The division specifically requested information in a letter dated June 29, 2005 from Phillip M. Simmons to Michael Hines regarding ownership of the wastewater collection system, treatment system, and drip disposal system and the land upon which they were to be constructed. This request was based on rules of the Department 1200-5-2-.02 (8), which states that:

Prior to the approval of final plans and specifications for sewerage facilities that are not owned and operated by a municipality or public utility district, the Department must receive evidence of the ownership of the system by a satisfactory organization that will be responsible for the operation and maintenance (such organization as a corporation set up under the General Corporation Act of 1969, an organization that has a charter from the Tennessee Public Service Commission, or a title deed on FHA insured loans) of the system.

The applicant, Tennessee Wastewater, Inc. is a privately owned company acting as a public service utility under regulation by the Tennessee Regulatory Authority, (TRA, formerly the Tennessee Public Service Commission). Tennessee Wastewater, Inc. has indicated that they will apply for a Certificate of Convenience and Necessity applicable to this specific project from the TRA upon receipt of the TDEC permit. It is the position of the Division that Tennessee Wastewater, Inc. qualifies as a satisfactory organization under the section of the rule specified above. This is consistent with prior division policy regarding SOP permits involving applicants that are TRA regulated. However, the division must also be assured that the applicant will own the treatment system, including the land where the lift stations, biological filter, and drip dispersal areas will be located. Review of tax map data from Carter County indicates that the property on which these facilities are proposed to be located is currently owned by Elizabethton Estates LLC, the organization financing the development of the apartment complex. No evidence has been presented by Tennessee Wastewater Inc. (in the form of signed contracts of sale, signed agreements for perpetual easement, or signed options for purchase) that they are, or will be, the owners of this property.

Tennessee Wastewater Inc. has responded that they will contract with the property owner/developer to provide sewerage service only after the State Operation Permit has been obtained. However, due to the complex nature of this project involving multiple treatment/disposal sites within a wellhead protection area, it is important that the state review and approve any ownership/perpetual easement agreements and operation agreements prior to issuance of a permit. This is particularly important considering that the viability of the project is in question based on the fact that the developer, Elizabethton Estates LLC, has been administratively dissolved as a Tennessee business as of August 19, 2005 (based on information provided by the Tennessee Secretary of State's website).

Considering all the information received and evaluated regarding this proposed permit, it is the determination of the division to deny issuance of a final permit for this facility at this time. The reasons for denial are:

1. Insufficient information has been provided by the applicant regarding the soils associated with the Cornfield site and the Gun Range site as described above, and
2. Insufficient information has been provided by the applicant regarding the applicant's ownership of the wastewater treatment facilities and the land upon which they will be built.

This denial is based on lack of receipt of specific information requested from the applicant. It is the position of the division that the requested information is necessary for the division to evaluate whether the proposed treatment system will, or will not, be protective of the public health and the environment. It does not imply that the division considers the apartment complex or the proposed treatment/dispersal concept totally unsuitable for the locations specified by the applicant.

A letter stating the division's is denying the permit will be sent to the applicant at the same time that this Notice of Determination is issued. The applicant has the right to appeal the decision to the Water Quality Control Board or may reapply for the project after the above requested information has been obtained.

Edward M. Polk, Jr.

_____ 11/2/05

Edward M. Polk Jr., P.E. Date

Manager, Permit Section

Division of Water Pollution Control